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## EYE-STRAIN

AND ITS RELATIONS TO "CEREBRAL HYPERÆMIA," ETC.\*

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EYE-STRAIN, more especially that due to paresis or original weakness of the third and sixth cerebral nerves, produces many symptoms besides cephalalgia and migraine which have lately received so much intelligent attention. The symptoms to which I refer are fully as important as cephalalgia and migraine, but have been generally, if not universally, misunderstood because practitioners have blindly followed the theoretical teachings of certain authorities.

The chief of these symptoms are: Occipital, suboccipital, and occipito-cervical pain and distress; a sense of stiffness in the occipito-cervical region ("at the base of the brain," as is commonly said); feelings of fullness, pressure, or lightness in the head; sensations of numbness or of formication in the scalp; varying degrees and forms of dizziness (but not true vertigo †); inability to read, write, sew,

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† Aural or labyrinthine vertigo and vertigo from evident or latent diplopia are, of course, excluded. In such cases true vertigo (subjective whirling or turning) exists, and often no other cerebral symptoms are present.



converse, sit at table, to go on the street or into rooms, and even to "think," without supervention or aggravation of symptoms; fear of certain places; insomnia; emotional attacks; pains (differing from migraine) in various parts of the head; and, later, also the multiple symptoms termed neurasthenia. Individual patients describe these subjective symptoms somewhat differently, according to their ability of observation and their facility of expression.

The above-mentioned symptoms, variously grouped and sometimes combined with others, have been appropriated by the advocates of a fanciful vaso-motor pathology; and such wholly theoretical "diseases" as "*cerebral hyperæmia*" (Hammond) and "*congestion of the base of the brain*" (Brown-Séquard) have been accepted by the profession with but too little open criticism, and multitudes of patients have been treated by remedies *deductively* considered as useful, such as the actual cautery, cups, and blisters to the neck, the ice-bag to the head and spine; internally, ergot, the bromides in full doses, belladonna, and (contrary to the theory, but found useful in practice) strychnine. Such cases have never been cured, I believe, by these means alone, though often relief has been obtained by the analgesic effects of the remedies and by the *suggestion* of the confident specialist.\*

I have never recognized these so-called "diseases," but have always recorded and spoken of the symptoms as paræsthesiæ of the head (*cephalic paræsthesiæ*), awaiting the time when experience might lead to their more correct interpretation.

To be brief, I now believe that I can offer a preliminary partial grouping of these symptoms according to their pathogenesis, not by any means a perfect scheme, but one which may serve as a basis for further and more minute observation and better classification.

1. The majority of cases presenting such symptoms are, I think, cases of eye-strain : exhaustion and hyperæsthesia resulting from the persistent use of weak neuro-muscular organs, more especially the third and sixth nerve apparatuses. Errors of refraction seem to play but a secondary part in the genesis of the symptoms, whereas they are very important in cases of cephalalgia and migraine. Most of all, suboccipital pain and distress (the chief symptoms of "congestion of the base of the brain") are due to defective power of convergence and accommodation. Not rarely, in all categories, the symptoms appear within a short time or suddenly, after years of apparently easy use of the eyes. This sudden onset may often be traced to the action of some debilitating influence, such as an attack of acute disease, to over-use of the eyes, etc. ; and it often coincides with the "failure of accommodation," normal or premature. In other words, the strain and fatigue resulting from the use of weak eyes are often long compensated or rendered latent by perfect health.

2. Some cases (my experience does not enable me to state a proportion) of cephalic paræsthesiae are due to dyscrasic conditions, more especially lithæmia, oxaluria, latent gout—in general terms, to conditions of suboxidation. The early stage of cirrhosis of the kidneys is sometimes characterized by these symptoms and obstinate headache, and in these cases the arterial tension is persistently high, the urine is overabundant, of low gravity, contains hyaline casts with or without albumin ; attacks of convulsions and of slight hemiplegia are not rare.

3. Such symptoms as lightness in the head, pressure in any direction (I do not believe that the *direction* of the pressure, a purely subjective interpretation by the patient, has any meaning in the present state of our knowledge), and deficiency in power of attention, memory, etc., may un-

doubtedly be caused by anæmia of the brain from general anæmia or through valvular cardiac disease, feeble heart, etc.

4. It is also possible that occasionally these symptoms indicate the beginning of organic cerebral disease, but at present we can not feel sure of this in a given case.

5. Probably cephalic paraesthesiae are developed by the action of peripheral—*i. e.*, extra-cerebral—lesions, as in some cases of “spinal irritation,” etc.

The chief purpose of this note is, however, to endeavor to advance the problem, as presented in group 1, one step further, and to state (from observed facts only) which of the above-mentioned symptoms may be caused by paresis of the third nerves and their muscles, and which by paresis of the sixth nerves and their muscles, apart from the element of refraction, which is also important.

The necessity of stating my views in so small a compass must be the excuse for the following condensed summary of two symptom-groups which deserve more ample treatment:

A. *Symptoms of Paresis (Insufficiency) of the Third Cerebral Nerves and Attached Muscles.*—Occipito-cervical pain and “distress” are the characteristic symptoms, sometimes the only ones. The pain, diurnal as a rule, and often not appearing until the patient has used his eyes in dressing, eating, or reading, is usually greatest between the occipital bone and the second vertebra, though it often extends from the upper part of the occiput to the fourth or even the sixth vertebra. It is sometimes more a “distress” than a true pain, and is often accompanied by sensations of stiffness and tightness (“as if a hand grasped the neck”). There is never, strictly speaking, neuralgia of the occipital nerves, or objective rigidity as in beginning caries. Tenderness is rarely found, though in women spinal hyperesthesia (so-called spinal irritation) often coincides. Frequently there is a sensation of weight or downward pressure on the back.

part of the head, with (usually) intermittent numbness (a "dead" or "wooden" feeling) and formication. In some cases the fullness or tightness (cincture or cap feeling) extends to the whole head.

Apparent loss of power of attention and concentration (volition) is much complained of, even to a degree simulating mental failure.\* Reading, writing, sewing, piano practice, conversation, even eating, are painful or unbearable; in other words, the symptoms are increased by any act requiring convergence and accommodation. It is sometimes said by patients, in objection to the suggestion of eye-strain, that the symptoms appear or are increased by "simply thinking"; but this statement involves ignorance of the psychological fact (or law) that in thinking, giving attention, concentrating our mind, and in willing—in all such apparently purely psychic acts—we unconsciously send out motor impulses to the ocular apparatus chiefly, but also to many other muscular groups. Any one can, by a few moments' study of himself, verify the truth of this statement that giving attention or willing usually includes external muscular activity (unconscious, as a rule). Thus eye-strain occurs in persons who do not mean to use their defective eyes.

The prolonged duration of these symptoms, or rather of the strain, may lead to neurasthenia, insomnia, and a curious mixture of hysteria and hypochondria, so that the diagnosis becomes more obscure.

Headache is not rare, but in such cases there are also usually faults in refraction or other factors. Simple asthenopia, sense of fatigue, or pain in the eyes, orbits, brow, or temples, is only occasional, and seldom a prominent symptom. Usually the patient pretends to have strong eyes.

\* Some cases of "breaking down" at school from "overwork" belong to this category.

*B. Symptoms of Paresis (Insufficiency) of the Sixth Cerebral Nerves and Attached Muscles.*—In contrast with the symptoms of insufficiency of the third nerve apparatus, the symptoms of this condition are diffused, variable, and less definite. Perhaps the most prominent is dizziness, or “vertigo,” as stated by the patient. But close questioning shows that this is not a true vertigo, but a sense of unsteadiness, of uncertainty of equilibrium, of confusion, clearly referred to the head. Allied to this is nearly always a sense of indefinite fear. At times the dizziness is so great as to oblige the patient to keep his room and to give up all ordinary duties and relations. Going out upon the street or entering rooms filled with people intensifies the feeling to an insupportable degree, and the patient needs the moral or physical support of another person.

Various and peculiar sensations are felt in the head—such as a sense of fullness, “as if the head would burst”; a downward pressure on the head, diffused or localized, “as if a stone or a sharp stick” pressed on it; a sense of constriction, general or cincture-like; pain in various areas of the scalp; occasional feelings of numbness (a “dead” or “wooden” feeling), or of formication or wormlike crawling, also variously distributed; a quasi tinnitus or noise in the head (not in the ears) is not rare.

As these paræsthesiae are increased by the sight of moving objects in a small or large space (on the street, where machinery is in motion, or where a number of people are moving), we often meet with conditions like those termed agoraphobia and claustrophobia; and I am confident that many cases recorded under these titles have really been cases of eye-strain. However, I admit that there are such cases which depend upon more general pathological conditions. I should add that the movements necessary to make the examination of the eyes of these patients fatigue them

very much, even the simplest test of the recti muscles by the index finger causing distress. Hence examinations should be made slowly and in several *séances*.

Apparent loss of mental power is perhaps more marked a feature of these cases than of those of category A. The patient can do things fairly well all alone in the quietude of his room, but in his relations with the world he seems to lose all self-control and power of attention and concentration. In consequence of the distress attending going out upon the street and meeting other persons, such a degree of emotional disturbance (loss of self-control) is developed that the patient is said to be hysterical. His symptoms absorb his attention so much that he often is called hypochondriacal as well.

Insomnia and neurasthenia are results of long-continued eye-strain in this category as in the first—perhaps more. It is in these later stages of the affection that the diagnosis becomes obscure, and can only be determined by prolonged observation and by trial of treatment. For it is not easy to say at once, in a case presenting symptoms of neurasthenia and hysteria (perhaps also “spinal irritation”), together with defective eyes, which of the conditions is primary and pathogenetic. The relation of cause and effect is doubtless in either direction in different cases, and it will be for future observation to give us the elements for judging this important question more quickly and positively.

In the few cases which I have seen in which all the ocular muscles were paretic, the (multiple) symptoms were more like those of category B.

It may be said that there is a certain overlapping of semeiology in this sketch of the two symptom groups. This is true, but I believe that further study will make the distinction more complete, though it must be remembered that these overlappings appear in nearly all symptom groups.

which we attempt to represent as "diseases." This note is suggestive only, and I do not pretend to state more than the main outlines of the question.

It is probable that a special grouping of symptoms will be found to be due to "spasm of accommodation," which so often complicates errors of refraction. I have not the data for any suggestion in this direction, except to say that headache and migraine will be found prominent.

*Diagnosis by Manipulation.*—It is out of my province to speak of the ophthalmic examination necessary in all such cases; but I desire to call attention to the facts that the simple test of convergence, by approximating a small object to the patient's nose, increases the suffering of subjects of the first category, while those of the second category experience great distress when made to look outward or around without moving the head, or if a bright object is moved circularly, or a wheel rotated before them. Complete atropinization gives these last patients great relief.

*Diagnosis by Drugs.*—In the present state of medicine this is occasionally a final resort. We employ it in supposed malarious and syphilitic cases, even while remembering that quinine does cure some non-malarious conditions, and that mercury and iodide of potassium are occasionally efficacious where syphilis is out of the question. A trial by bromide treatment often enables us to correctly judge cases in which hysterical and epileptic symptoms are conjoined. In cases of eye-strain, experience has taught me that cases of the first category (third-nerve paresis) are relieved by nux vomica or strychnine, and are aggravated by belladonna and other mydriatics; whereas, on the contrary, the last-named remedies give relief to cases of the second category (sixth-nerve paresis), and strychnine makes them worse. In some uncomplicated cases of paresis o

the third nerves (insufficiency of the recti interni or of the ciliary muscle) an apparent cure is obtained by a progressive course of strychnine.

I can not in this note refer *in extenso* to the treatment of all such cases, but will simply repeat what is stated in the text of the *Lectures*—viz., that, apart from the adaptation of proper glasses and prisms, in some cases the use of partial or total tenotomy or myotomy, which are all of the utmost importance, the scientific treatment consists in the internal use of nux vomica, strychnine, and nerve tonics generally in cases of category A, and of cannabis indica, belladonna, atropine, conium, the bromides, antipyrine, etc., for cases of category B. Of course, in cases of both categories, rest, much more complete than is usually prescribed (even ocular rest by prolonged atropinization), and a general restorative treatment, are necessary. Change of scene and travel are useful, but should never be prescribed until all the visual defects have been corrected and convalescence is evident. Work should not be resumed except with the aid of the most appropriate optical correction, and by degrees. It must be added that there are eyes which can not be “corrected” with our present appliances, and in such cases the prognosis is bad, although temporary improvement may be obtained by proper medicinal and hygienic treatment. I would, lastly, suggest that tobacco is particularly injurious to persons whose third nerves are weak.





